Workshop Session #1:

Policy and User Requirements for Embedded Training

Summary of Discussion

Dr. Stephen Goldberg (USA) facilitated this session on policy and user requirements related to embedded training. Lessons-learned and examples of embedded training applications were explored in the two papers presented during this session:

- *The Opportunities and Challenges of Embedded Training* - Brian Crabb, Ph.D. (USA), Army Research Institute; Jennifer Phillips (USA), Cognitive Performance Group; and William Ross (USA), Cognitive Performance Group

- *F-35 Embedded Training* - Conrad Bills, Ph.D. (USA) Lockheed Martin; Brian Flachsbart (USA) Lockheed Martin; LCDR Shawn Kern (USA), U.S. Navy; and Dave Olson (USA) Lockheed Martin

Workshop Exercise #1: ***Mindmapping Embedded Virtual Simulation EVS requirements***

As in all of the workshop exercises, three groups were formed from the attendees to address critical questions related to EVS through a mindmapping exercise. The three groups were facilitated by:

- Group 1: Dr. Goldberg and Dr. Magee;
- Group 2: Dr. Roessingh, Ms. Koerhuis and Dr. Andrews;
- Group 3: Dr. Hourlier and Dr. Alexander

For this session, the mindmapping exercise focused on <u>EVS requirements</u> and the three questions below were intended to focus and energize the discussion:

- What potential operational systems are good candidates for the application of embedded virtual simulation (EVS)? Why?
- What are the human factor challenges for performance and training in EVS?
- What are the limitations in applying EVS?

The mindmaps shown below are the group products from Exercise #1 on EVS requirements:

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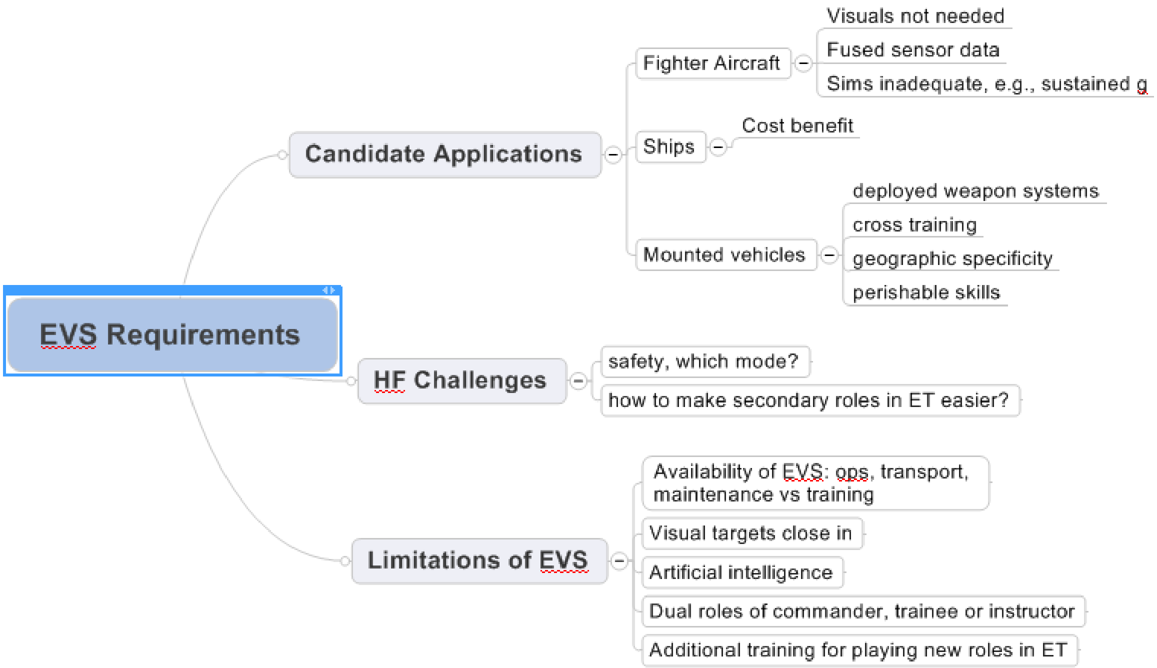

Figure 1: Group 1 Mindmap for Exercise #1

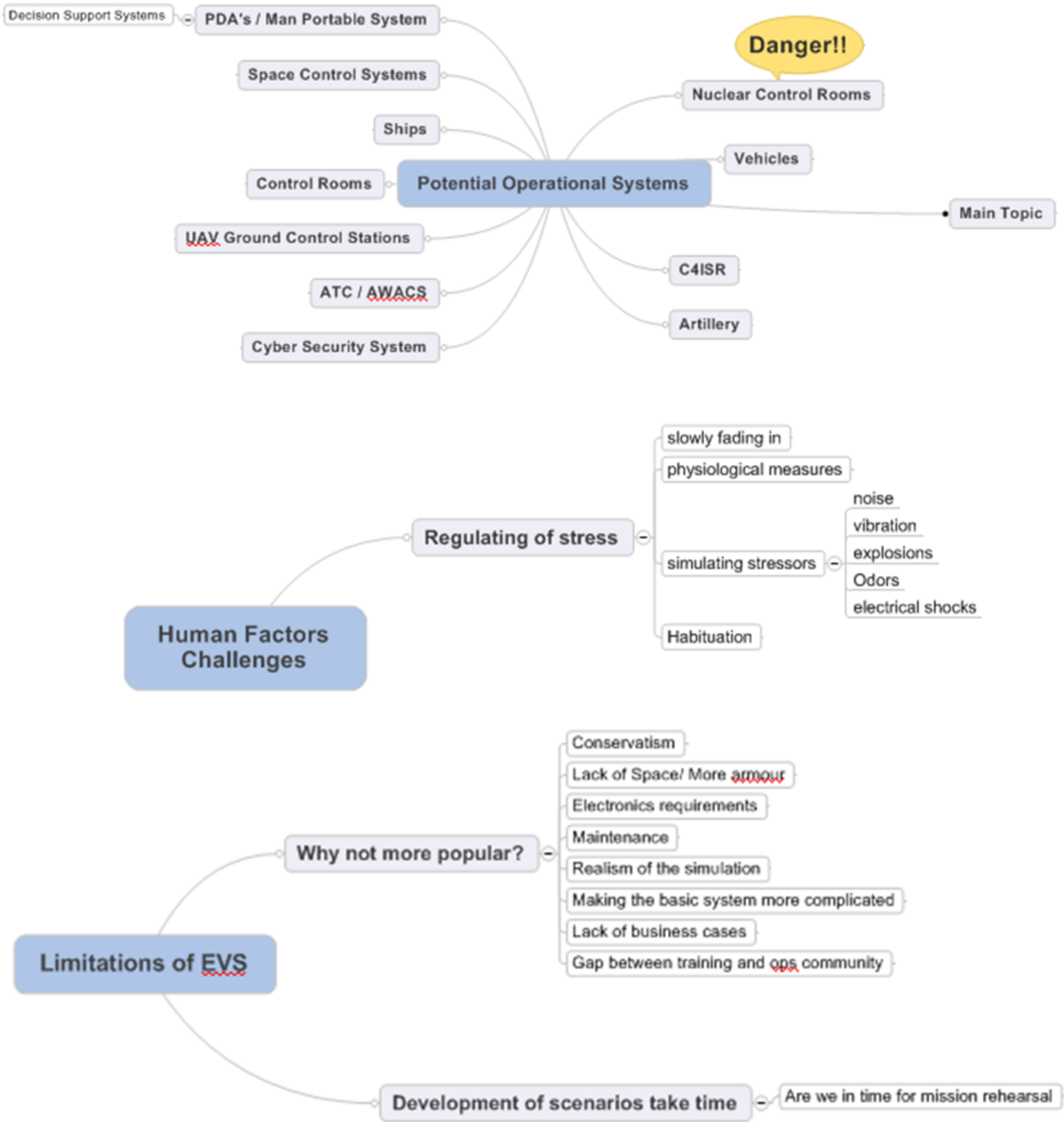

Figure 2: Group 2 Mindmap for Exercise #1

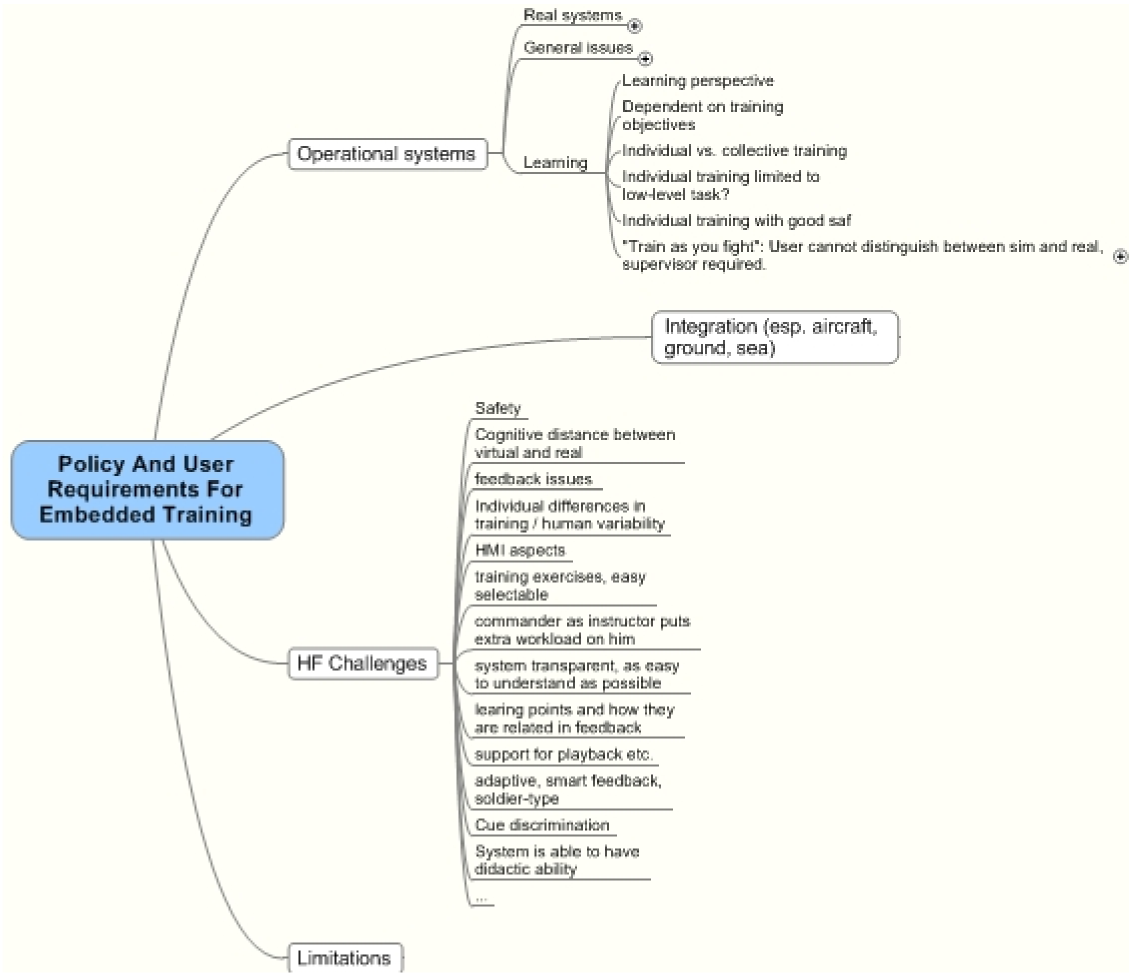

Figure 3: Group 3 Mindmap for Exercise #1

The three groups that produced mind maps had some common themes and some differences to include the level of detail which they represented the space. Each group was given three higher level organizing topics. Those were candidate applications, human factors issues, and limitations of the embedded virtual simulation.

Candidate applications: The requirements for virtual embedded simulation cut across a wide variety of applications. The overarching capability of all of the systems identified was that the trainee would be sitting at a workstation at which he would receive inputs either through information presented on displays within a vehicle or system or a view of a virtual environment representing some geo-typical or actual real world location. The types of systems that were identified as virtual embedded simulation candidates include aviation, ground and sea systems. Also identified are command and control centers to include various types of control rooms. Another potential type of candidate application was to embed training into hand-held devices such as intelligent phones or net-books. The level of realism identified included high fidelity to enable service members to "train as they would fight."

Human Factors Issues: The most serious Human Factors issue that was identified by more than one of the groups was developing requirements that ensured safety particularly when operating a weapon system in training mode. Use of actual equipment opened up the potential for mistakenly being in operational mode

when the weapon system should have been in training mode. Requirements need to ensure that designers will carefully consider building in differences in operational and training displays and or designing switches and warnings to ensure that switching from one mode to the other is a conscious and deliberate act. One of the groups focused their human factors comments on the effects of stress on training. Particular emphasis was placed on including requirements for stress inducing stimuli that affected more than one sense. Additionally requirements to ensure the training approaches used were well designed and the system included training features such as after action review systems and appropriate levels of fidelity.

Limitations: The participants identified a number of factors limiting the use of EVS. Ready access to the operational equipment was identified as a factor since operational equipment might not always be available, when the trainees might want to use it the most, for example, during transit to the operational theatre. The availability of operational equipment for training is also limited by the need to maintain it.

The lack of support staff for training was also identified as a concern because artificial intelligence is not seen as sufficiently ready or advanced to provide automated tutoring, credible opposing forces, or supporting role players for training. Hence, the technology limitations of artificial intelligence and human behavioral modeling can impose additional workload on others. The challenge of successfully integrating the functionally of ET systems into the human-machine interface of operation equipment is an additional burden placed on both the designers and users that could limit implementation and ease of use.

Other reasons why EVS has not been become more popular as a result of human factors limitations include the practical concerns about the needed infrastructure and maintenance for complex training systems and the lack of tools for ready scenario development, particularly for mission rehearsal.
The workshop participants also thought that the cognitive distance between real and training environments, that is the fidelity of the EVS, and their relationship to training effectiveness, remains a concern due to the limits of technology and behavioral information about the efficacy of ET systems.